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Comparison of approximation quality of earth's surface for different landform types (On examples of algebraic and trigonometric trends)

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Abstract

© SGEM2017. All Rights Reserved. Quality of trend-surface approximation of four sites on East European plain was estimated. The sites were selected under condition of location in the landform's regions with different genesis of Earth's surface according to Geomorphological map of USSR 1:2500000. This regions includes are initial plain (Caspian lowland), areas of moraine (Smolensk-Moscow upland) and erosional (Central Russian upland) relief, structural and erosional Ural's foothills. Two types of approximation methods were used: 2D algebraic polynomial (AP) trends computed by least square approach and 2D discrete Fourier transform (trigonometric polynomial, TP). The article aims to show that method's differences affect quality of fitting. At the equal length of the analytical form of surface's representation the trigonometric trend has priority often. The Fourier transform allows fitting the small landforms which have spatial regular pattern. High frequency oscillations can be fit by some separate harmonics. On the contrary, at the algebraic approximation the small landforms can be fitted by only whole set of trend's coefficients. It was found that Fourier transform gives more coarse result in one case only — on the fitting of low-dissected initial plain. Errors of approximation are 1.6 m (at the use 6th degree algebraic polynomial with 28 coefficients) and 5.5 m (at the use the same length trigonometric polynomial). The opposite situation was registered in other cases. On the site of erosional dissected upland at the use of polynomials from 1st to 6th degree were obtained error's values more than at the use Fourier series of the same length. On the site of Ural's foothills Fourier transform allows the strictly smaller error from 2nd degree of polynomial and on the site of Smolensk-Moscow upland — from 4th degree. So, in the some geomorphological conditions the using of TP can be more effectiveness than AP. The explicit exception of this rule is terrain with irregular, as "white noise", elevation's fluctuation.

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Keywords

European part of Russian, Landforms, Quality of approximation, Trend surface

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